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Response by Cindy Sage, Sage Associates
to URS Radiofrequency (RF) Evaluation Report
Use of Wireless Devices in Educational Settings
Prepared for the Los Angeles Unified School District

February 28, 2013

1. Does the URS Report Calculate RFR from WLAN Access Points and Wireless Tablets?

The stated goal of the URS Report literature summary is "*to research previous published reports pertaining to the implications of wireless technology into the school system, including recommended and regulatory limits for RF EMF exposure, and research on related wireless technologies as they may apply to wireless local access networks (WLANs)*." (emphasis added).

*"Based on the previous research and technical literature, URS has compiled a series of recommendations to assist the LAUSD in determining the ramifications of adopting WLAN technology within the school system."(*emphasis added*)*

Section 3.1 says: *"All wireless technologies, including cell phones, WLANs (i.e., WiFi), and Smart Meters, work in essentially the same way. For the purposes of this project, the report will focus on WLAN systems."* (emphasis added*)*

Section 2 of the URS Report says: "(O)*n August 9, 2012, Superintendent John Deasy announced the District's intent to distribute tablet computing devices to students. In response to the Superintendent's announcement, ITD prepared a Common Core Technology Project Plan (CCTPP). The CCTPP identifies the factors behind the project and outlines the additional components and approach necessary to accomplish the distribution of tablet end-devices. The CCTPP is an addendum to the April 2012 SEP and expands upon the scope of the VLC CTMP*."

It is unclear whether this URS Report addresses the potential emissions and possible health impacts of wireless devices held by children in their hands and/or laps; and the RFR contribution of multiple operating tablets in one classroom, as well as the wireless access point emissions (the WLAN access points contribution to overall classroom RFR). Calculations should be included in the revised URS Report to LAUSD.

URS has advocated compliance with the 2007 BioInitiative Report level of 0.1 microwatts per square centimeter (0.6 volts per meter). The stated conclusion (Section 6) says: "*A recommended cautionary level of 0.1 mW/cm2 is attainable within LAUSD classrooms, based on calculations that have been performed*." (emphasis added) Providing the calculations will show what RFR exposure sources are considered; and how compliance with the 0.1 uW/cm2 level is confirmed.

Compliance would have to encompass all the 'wireless classroom' sources including the tablets and the wireless access points. A careful reading of the URS Report seems to indicate that only the whole-body WLAN emissions are investigated (calculated) for Common Core program compliance, but not the contribution of hand-held wireless devices (tablets) themselves.

The revised URS Report should provide calculations, and the assumptions on which the modeling is based in order for independent review to be possible. Please provide assumptions on distance of student from wireless tablet; student from wireless access point(s); number of wireless access points per classroom, the duty cycle assumed and which FCC equation(s) are used for calculations (FCC OET 65 Equation 6 or 10).

2. What is Meant by Time-averaging?

"*URS recommends a cautionary level of 0.1 uW/cm2, taken as a whole-body, time-averaged value*."

There is another reason why it is not possible to determine from this report whether compliance with the 0.1 uW/cm2 RFR exposure level will likely be achieved. URS recommends a cautionary level of 0.1 uW/cm2, taken as a whole-body, time- averaged value, which is consistent with accepted practice (FCC, 1997).

This does not specify the time averaging period, which could be any period of time. It also does not say if the wireless access points are turned off when classes are not actively accessing the internet via wireless devices. It does not say whether the access points are hardwired or plug-ins. Hardwired access points cannot be turned off, so that would mean constant RFR exposures in every classroom. Time averaging for whole-body exposures could render the recommendation meaningless if it includes too much time, diluting out high RFR exposures of by making them invisible over a longer time course combined with 'no exposure' periods of classtime.

3. Does the URS Report Substantiate that the LAUSD Common Core Wireless Classroom Program Complies with BioInitiative 2007 Recommendations?

Compliance with the 2007 BioInitiative recommendation of 0.1 uW/cm2 (0.6 volts per meter) is unlikely to occur when the RFR levels of exposure from wireless devices (tablets) as well as the RFR from WLAN access points are included in this assessment.

If the the very substantial RFR emissions from wireless devices themselves are ignored, in addition to whole-body RFR emissions from WLAN access points, the calculations would not allow a demonstration of compliance with its primary recommendation – to comply with the 2007 BioInitiative Report level of 0.1 uW/cm2.

Each tablet operating in a classroom will create more cumulative RFR to which all other children are then exposed (whole-body) as well the localized RFR exposure to the child holding the tablet. The Report is not then informative to the LAUSD about '*the implications of wireless technology into the school system*". Decision-making about health impacts to children that may result from adoption of the wireless component of Common Core programs needs to address all wireless components of the Common Core wireless technology proposal, not just one contributing portion.

The literature summary concludes "(*T)he technical literature is conflicted regarding RF EMF exposure and health effects. While many studies conclude that there are no adverse health effects from RF EMF exposure, others conclude that adverse health effects may result from long-term exposure to high level RF EMFs. Fewer studies have been performed on the health effects of RF EMF exposure as compared to studies on extremely low frequency (ELF) EMF exposure, but the literature is also conflicted. Some studies claim no adverse health effects were found, while others claim to have observed adverse health effects*."

This is a non-informative summation. "Conflicted" is not a useful term in this context. It diminishes the weight of substantial evidence for possible health harm. It implies that 'conflicted' equates to 'unknown' and the studies overall somehow 'balance out' to equal nothing. There are thousands of peer-reviewed, published scientific papers reporting bioeffects and adverse health effects from low-intensity ELF-EMF and RFR exposure. There are also many papers that do not report effects. But, this is typical of scientific investigations in all areas of research.

4. URS Omits Mention of DDT and Lead as Group 2B Carcinogens (Section 4)

URS does address the most important scientific review by international experts appointed by the WHO IARC that classified RFR as a Group 2B Possible Human Carcinogen. However, in the listing of other 2B carcinogens, the Report should be revised to list DDT and lead as well, which are both in this same Group 2B as RFR. Those listed in the URS Report only include coffee, coconut oil, pickled vegetables, gasoline exhaust, talcum powder, and nickel. Clearly, no child would be required by any school district to consume any of these substances every day as a mandatory part of classroom participation, particularly DDT and lead, for which the District already has strict controls and policies in place.

The salient point of this assessment is absent – that LAUSD is proposing to install a technology that exposes hundreds of thousands of adults and children under it's jurisdiction to a designated Possible Human Carcinogen with chronic RFR levels associated with increased risk of health harm (Baan et al, 2011).

5. The URS Report Does Not Fully and Properly Characterize BioInitiative Report Recommendations

The URS Report should fully characterize the BioInitiative Report recommendations in both the 2007 and 2012 Reports. URS should more carefully relay to LAUSD the conclusions of Sections 1, 20 and 24 in the 2012 BioInitiative Report that specify that children should not be exposed to wireless technologies, regardless of RFR exposure levels, while in schools.

No numeric level of RFR is judged to be acceptable for children in BioInitiative 2012.

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Chronic exposure to wireless RFR for children in home and school environments is not recommended (expressly warned against) in both Sections 20 (Autism and EMF/RFR) and 24 (Key Scientific Studies and Public Health Implications) of the BioInitiative 2012 Report.

Here is the URS discussion of the BioInitiative 2007 and 2012 Report recommendations:

> "*Based upon the technical research, several agencies have proposed voluntary standards for all EMF exposure. Countries have adopted widely-varying standards, ranging from 10 to 1,000 uW/cm2. Independent organizations, such as the Bioinitiative Report, have proposed cautionary levels as low as 0.1 uW/cm2 (2007) and 0.0003 uW/cm2 (2012), although these are recommendations only.*"

The BioInitiative 2007 Report recommendations should read:

> *" A precautionary limit of 0.1 µW/cm2 should be adopted for outdoor, cumulative RF exposure. … An outdoor precautionary limit of 0.1 µW/cm2 would mean an even lower exposure level inside buildings, perhaps as low as 0.01 µW/cm2*

The BioInitiative 2012 Report (Section 20) recommendations should be amended by adding:

> *"Children with existing neurological problems that include cognitive, learning, attention, memory, or behavioral problems should as much as possible be provided with wired (not wireless) learning, living and sleeping environments. Special education classrooms should aim for 'no wireless' conditions to reduce avoidable stressors that may impede social, academic and behavioral progress. All children should reasonably be protected from the physiological stressor of significantly elevated EMF/RFR (wireless in classrooms, or home environments). School districts that are now considering all-wireless learning environments should be strongly cautioned that wired environments are likely to provide better learning and teaching environments, and prevent possible adverse health consequences for both students and faculty in the long-term. Monitoring of the impacts of wireless technology in learning and care environments should be performed with sophisticated measurement and data analysis techniques that are cognizant of the non-linear impacts of EMF/RFR and of data techniques most appropriate for discerning these impacts. There is sufficient scientific evidence to warrant the selection of wired internet, wired classrooms and wired learning devices, rather than making an expensive and potentially health-harming commitment to wireless devices that may have to be substituted out later. Wired classrooms should reasonably be provided to all students who opt-out of wireless classrooms."*

The BioInitiative 2012 Report (Section 24) recommendations should be amended by adding:

> *"Children should not use wireless devices except in the case of emergencies, or be exposed on an involuntary and chronic basis to wireless in their living, sleeping or learning environments."*

> *"Wireless laptops and other wireless devices should be strongly discouraged in schools for children of all ages, and wireless systems already installed should be replaced with wired (cable) alternatives. While without question it is important for children to have access to the internet, wired computer laboratories will have no elevated exposure to RFR. What might be lost in flexibility of moving rooms arounds will be more than gained by reducing exposure to RFR if wired connections, rather than wireless, are used. Pregnant women should be strongly cautioned not to use wireless devices during pregnancy. If a school already has wireless facilities, classrooms without wireless should be made available to students, teachers and staff during the transition if sensitivities to EMF are reported by the individual. Special education classroom teaching environments should offer wired teaching environments (not wireless), nor should they be exposed to off-site wireless radiofrequency radiation from other sources that elevate interior levels for children."* (emphasis added)

6. URS Has Not Document the RFR Baseline Studies It Refers To When Dismissing the BioInitiative 2012 Numeric Recommendation as Unrealistic and Unattainable

"*The 2012 Bioinitiative Report recommended cautionary level of 0.0003 uW/cm2 is unrealistic and unattainable, as background RF levels are above this precautionary level."*

Please provide data on which this assumption is based. Has anyone conducted baseline RFR studies at these schools? If LAUSD has conducted baseline RFR measurements of school campuses and classrooms where WLAN technology is proposed, it should be included in the revised URS Report.

7. Is This Cell Tower Technology in the Classroom?

Approval of the Common Core Technology program for wireless devices and classroom wireless access points will violate the Board of Education policy on cell tower radiation.

The URS Report reports that *"(I)t was alleged that by doing so, the LAUSD would be placing cell tower technology within classrooms. In essence, the District would be violating BOE policy and exposing children to excessive RF radiation."* (Section 2.1.2).

This is exactly correct. The URS Report confirms that cell phone radiation frequencies of the type from WLANs proposed under the Common Core Technology program are essentially the same as for cell phone communications and data transmissions in Section 3. *"Because Smart Meters, cell phones, and WLAN devices share many commonalities, a summary of each of these technologies and recent research on RF EMFs pertaining to these devices is summarized below."*

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8. URS Discussion on Sage Report on Smart Meters is Factually Incorrect

From the URS Report, Section 3.

> "*Most notably, the Sage study did not time average the data collected, used out-of-date FCC policy, claimed that a 1000%+ reflection was possible, assumed that incident power density is enhanced by reflections uniformly throughout the surrounding space, and did not frequency-weight the contributions from the endpoint meter, the home area network, and the cell relay, all of which operate at different frequencies*."

This is factually incorrect. We request that this error be corrected, and a revised report be prepared by URS and transmitted to LAUSD, its Board and staff. Our report used FCC OET 65 formulas using 60% and 100% reflection factors. Please revise and recirculate.

The Sage Report on Smart Meter RF Emissions (2011) calculated four reflection coefficients including 60% reflection (FCC OET 65 Equation 10), 100% reflection (FCC OET 65 Equation 6), as well as 1000% and 2000% reflection factors. All calculations are available for review. The study is entirely consistent with FCC rules. Further, URS should amend its discussion to note that duty cycles from 1% to 100% (in intervals of 10% per table) were provided.

9. URS Report Calculations Are Required by FCC Rules to Use a 100% Duty Cycle

But most importantly, both URS and LAUSD should be made aware that the FCC rules in OET Bulletin 65 mandate a 100% duty cycle when using the FCC equations 6 and 10 "where the public cannot be excluded." Certainly this applies to WLAN calculations within a classroom where student attendence is mandatory, rather than excluded. The URS calculations are REQUIRED to use a duty cycle of 100% by FCC rules (Sage, 2011).

10. URS Summary - Errors and Omissions

"Research on wireless devices, including cell phones, Smart Meters, and WLANs, has resulted in similar conclusions."

This would lead to a conclusion then that because cell phones are consistently linked with increased risk for glioma and acoustic neuroma, that WLAN exposure is quite unsafe?

· *Duty factors for all wireless end devices are reported to be quite low, ranging from 0.01% to 5%, with a typical duty factor for all applications (except APs) around 1%.*

Exposures for some wireless laptops and wireless devices are shown to result in excessively high levels of RFR exposure for the user, and even exceed FCC safety standards in some cases (BioInitiative 2012). This information should be considered in reaching a conclusion about compliance based on duty cycle.

· *WLAN devices, including laptops and tablets, operate at lower power densities than cell phones because the functional distance that the wireless devices operate over is much lower. Thus, RF EMF exposure from WLAN devices is expected to be lower than for cell phone use."*

" • Newer tablets and laptops can operate on either WLAN or 3G/4G technology. WLAN operates at lower power densities than 3G or 4G technology, which is essentially using a cell phone to connect to the Internet."

These last two statements do not seem to support a finding that either distance nor lower power density can equate to safety of use of a wireless tablet in the hands of a child, where the RFR wireless access point(s) contribute cumulative exposures, and where multiple tablet devices are operating and contributing additional RFR exposure.

IARC specifies that it is the exposure to RFR (not a particular device or source of RFR regardless of intensity) has been classified as a Possible Human Carcinogen. It is not possible to determine if tablet use exposes children to less RFR than cell phones. It depends on how they are used and how long they are used. And, it depends on the cumulative RFR from the user's tablet, all other tablets being used in proximity, and the WLAN access point RFR, and any other baseline sources of RFR in the classroom.

Mandatory WLAN device exposures are inherently risky for children in school classrooms. IARC designated RFR as a Possible Human Carcinogen in 2011. Surely the LAUSD would not now be able to defend WLAN at all; nor defend WLAN exposures as 'less risky' by comparison to mandatory use of cell phones. Cell phone use has been linked to a doubling of risk of malignant brain tumor in adults, and a five-fold increased risk for children. Wireless devices like tablets create very substantial RFR exposures, and it will be very difficult to control behavior of children in all cases, and not at all possible to monitor when wireless devices are taken home for homework. It also begs the question whether adoption of the Common Core Technology program means every home must also have a wireless router. This would further increase RFR exposures adding to potential health risks for an entire family, and increase the cumulative RFR burden on every school child (both home and classroom RFR exposure).

" · The many variations on the way Smart Meters are implemented makes generalizations difficult, but WLAN RF EMF exposure is expected to be lower than that of Smart Meters."

This is simply impossible to establish, and should be deleted. It depends enormously on the distance, how the smart meter is positioned in relation to occupied space, and how the space inside a home is utilized.

"This is because of the following reasons:
o Smart Meters communicate on a frequent, fixed schedule with other devices, where WLAN devices communicate on a sporadic, on-demand schedule.

This is factually incorrect and should be deleted.

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> • *Smart Meters communicate not only with the data-collection end device, but also with multiple appliances within the living space. In contrast, WLAN end devices, which would be responsible for most of a user's RF EMF exposure, communicate primarily with the AP only, and only to a much lesser degree with surrounding end devices."*

If this statement is meant to mean that Common Core Technology wireless exposures are less than that of smart meters, which transmit RFR to the power transmitters in appliances and also to the wireless electric meter, there is no basis for drawing a comparison yet. There is no verifiable basis for establishing this statement. Power transmitters are not yet commercially available and operating within the 'smart meter' system. No conclusions can be drawn yet as to exposures for occupants. Nothing in this statement provides for a legitimate comparison to a student in a classroom with multiple transmitting tablets being used by the other students, the RF exposure from the tablet the student is actually holding, and the wireless access point(s) installed around the room.

In conclusion, the URS Report should be revised and resubmitted to the LAUSD to rectify these factual errors and to clarify information that is vital to understanding whether compliance can be reached with the 0.1 uW/cm2 (0.6 V/m) BioInitiative recommendation. Further, the Report should give the complete 2007 recommendation language. Because 0.1 uW/cm2 is an outdoor, cumulative RF limit. Our report says an outdoor RF level of 0.1 uW/cm2 will typically result in an indoor level ten times lower, or 0.01 uW/cm2. Clearly the Common Core Technology program is operating indoors. It will make compliance with the 2007 BioInitiative Report recommendation more difficult to achieve.

Respectfully submitted,

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